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User's Manual for Automated Calculation of Fleet Noise Level and Airport Noise Index Index

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This manual provides instructions to the users of a series of programs that calculate fleet noise level (FNL) and airport noise index (ANI). The concept of FNL provides a method for evaluating the noise status of fleets of aircraft. Using FNL, comparisons can be developed between fleets for all airports or subsets of airports. It is an average of acoustical energies. The ANI is a measure that is sensitive to total acoustical energy.

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USER'S MANUAL FOR AUTOMATED CALCULATION OF FLEET NOISE LEVEL AND AIRPORT NOISE INDEX

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Prepared Under:
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For the

Office of Noise Abatement and Control
U.S. Environmental Protection Agency

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I. INTRODUCTION

The purpose of this manual is to provide detailed instructions to the users of a series of programs that calculate fleet noise level (FNL) and Airport Noise Index (ANI). The concept of FNL provides a method for evaluating the noise status of fleets of aircraft. It provides a single figure of merit so that the fleets of aircraft can be compared with each other with respect to noise. The concept of FNL is very flexible in that it can be applied to a wide variety of situations. For example, a general FNL could be calculated for all airports or any subset of airports in the U.S. The calculation could be done for any particular airline or any combination of airlines. FNL is calculated by the following formula:

$$FNL_i = 10 \log \frac{\sum_{k=1}^{n} N_{ki} (10)^{L_{ki}/10}}{\sum_{k=1}^{n} N_{ki}}$$

where: FNL_i = fleet noise level of the i-th aircraft fleet in dB

n = number of different types of aircraft in the i-th fleet

N_{ki} = number of operations for the K-th aircraft type in the i-th fleet

L_{ki} = noise level of the K-th aircraft type in the i-th fleet at a specified measuring point.

For a detailed explication of the concept of FNL see Reference 1.

Even a cursory examination of the equation of FNL will reveal that it is an average of acoustical energies. Thus it is possible that two fleets might have the same average noise level but could produce different levels of acoustical energy. In other words, two airlines or airports might have the same FNL but one of them might have a much greater number of operations. A measure that would be sensitive to differences in total energy is the Airport Noise Index (ANI). ANI is calculated by the following formula:

$$ANI = FNL + 10 \log (D/365) + 53j$$

where: ANI = airport noise index in dB

FNL = fleet noise level in dB

D = total number of yearly departures.

For an application of the concept of ANI, see Reference 2.

BACKGROUND

The computer program that this manual describes was written in response to a need by the Office of Noise Abatement and Control of the Environmental Protection Agency to perform automated calculations of ANIs, and the expected FNLs, when compliance with past, current, future, and proposed Federal aircraft source regulations is assumed. Further, the difference between actual and expected FNLs can be calculated. Although calculator programs are available that perform most of these calculations, they do not completely fulfill the needs of the Office of Noise Abatement and Control. Even though the calculator programs offer an enormous saving of labor over calculations performed by hand, when FNLs for even a relatively small number of airports are calculated, the job begins to approach the point of being prohibitively time consuming. A further advantage of automated calculation is that the number of errors is reduced to the lowerst possible minimum for large quantities of data. This manual provides an introduction to the use of the

program that calculates the quantities listed at the beginning of this paragraph. For the sake of brevity, the program will be referred to henceforth in this report as the "FNL Program".

USER PROFILE

This manual is intended for use by people who know little more about computers than how to log-on and log-off the system being used. Sample log-on procedures are given in Appendix A for the National Computer Center (NCC) of the Environmental Protection Center. However, these should be considered only as illustrative examples because such procedures can be changed at any time. The user should refer to current log-on information available from the NCC for all users of that system (See Reference 3).

The instructions for operation of the program begin at the point immediately after log-on and guide the user through the program so that the desired output may be obtained without any further knowledge of the techniques of computer operation. On the other hand, it is assumed that the user knows what he wants; that is, he is knowledgeable with respect to all of the quantities calculated by the program and can make an informed decision at each of the choice-points in the program as to which quantities he wishes to find in the results. No further attempt will be made to explain the concepts of FNL, effective perceived noise level (EPNL), ANI, or the various Federal aircraft noise regulations.

OVERVIEW OF THE FNL PROGRAM

The FNL Program is really eight different programs controlled by a master program. The component programs are:

Report	File
P2	P2F
P3	P3F
P4	P4F
P5	P5F

The programs under the heading "Report" were devised primarily to produce an easily readable report; the title given to the particular computer run and column heading are printed on every page of the report. Further, row headings

are printed for the various types of subtotals that may be calculated. The programs under the heading "File" were devised primarily to produce an output file that can serve as an input file for future calculations, for it contains no titles or column headings. The choice of which series to use depends entirely on the purpose the user has in mind for the results. A brief description of the quantities calculated in each of the programs in the series is provided in the following paragraphs.

P2 and P2F

The output for these programs will provide the following information: year for which the data were provided, airline that made the departures, airport from which the departures were made, whether the departure was a cargo flight, the type of aircraft, and total number of departures for the type of aircraft. Table 1 provides a sample page of an output from the P2 program. The first six column headings correspond to the six items of information listed previously. It should be noted that all of these items are data-dependent; that is, the output will provide the information only if it has been provided in the data base, the input data* file. For example, an input data file might contain nation-wide information on departures rather than information on individual airports. In this situation, "ALL" could be placed in the three spaces where the airport identification code would normally go to indicate that the calculations represent all airports. As another example, the output will not contain an identifying symbol for cargo flights if this information has not been included in the data.

The next nine column headings are based on information found in the input parameter file. The parameter file contains certificated, measured, or estimated aircraft noise levels taken from References 4, 5, and 6. In these publications, the Federal Aviation Administration (FAA) provides information on noise levels produced by all aircraft in service in the US airline fleet at the three measuring points specified in Federal Air Regulation (FAR) Part 36: sideline, takeoff, and approach. These publications provide noise levels for alternative engine installations in the same model of aircraft. Since this

*In the examples used in this report, the input data file has been constructed from Table 7 in References 7 and 8.

TABLE 1-1

SAMPLE OUTPUT FROM P2 PROGRAM

YR	AIR-LINE	AIR-PORT	C	AIRCRAFT TYPE	NO. FLTS	MODE	EMAX	EMIN	2	3	4	5	AMAX	AMIN
79	WA	LAX		DC-10-10	2848	SIDELINE	96.0	95.1	107.1	100.4	95.5	90.5	.0	.0
						TAKEOFF	99.0	94.6	105.8	100.2	96.7	92.7	88.9	84.5
						APPROACH	105.4	99.2	107.1	103.9	99.5	96.5	95.3	89.1
79	WA	LAX		AIRCRAFT TOTALS	27394	SIDELINE	104.7	102.1	104.8	97.6	93.1	88.1	82.8	82.8
						TAKEOFF	103.9	102.7	100.9	96.3	93.0	89.0	90.1	89.4
						APPROACH	112.4	109.7	104.6	101.9	96.9	93.9	101.6	97.4
79	WA	MIA		B-707-300C	67	SIDELINE	108.0	108.0	106.3	99.4	94.6	89.6	92.0	92.0
						TAKEOFF	114.0	114.0	103.7	100.6	95.3	91.3	101.2	101.2
						APPROACH	120.0	120.0	106.3	102.9	98.6	95.6	107.8	107.8
79	WA	MIA		B-720B	49	SIDELINE	108.0	108.0	105.3	98.1	93.6	88.6	92.0	92.0
						TAKEOFF	104.0	104.0	101.2	98.6	93.5	89.5	91.8	91.8
						APPROACH	117.0	117.0	105.3	101.8	97.6	94.6	104.8	104.8
79	WA	MIA		DC-10-10	772	SIDELINE	96.0	95.1	107.1	100.4	95.5	90.5	.0	.0
						TAKEOFF	99.0	94.6	105.8	100.2	96.7	92.7	88.9	84.5
						APPROACH	105.4	99.2	107.1	103.9	99.5	96.5	95.3	89.1
79	WA	MIA		AIRCRAFT TOTALS	888	SIDELINE	100.7	100.4	107.0	100.2	95.4	90.4	83.2	83.2
						TAKEOFF	104.4	103.6	105.5	100.2	96.5	92.5	92.4	91.2
						APPROACH	111.2	110.4	107.0	103.7	99.4	96.4	99.6	98.4
79	WA	SEA		B-707-300C	457	SIDELINE	108.0	108.0	106.3	99.4	94.6	89.6	92.0	92.0
						TAKEOFF	114.0	114.0	103.7	100.6	95.3	91.3	101.2	101.2
						APPROACH	120.0	120.0	106.3	102.9	98.6	95.6	107.8	107.8
79	WA	SEA		B-720B	358	SIDELINE	108.0	108.0	105.3	98.1	93.6	88.6	92.0	92.0
						TAKEOFF	104.0	104.0	101.2	98.6	93.5	89.5	91.8	91.8
						APPROACH	117.0	117.0	105.3	101.8	97.6	94.6	104.8	104.8
79	WA	SEA		B-727-200	6594	SIDELINE	104.5	100.2	104.8	97.5	93.1	88.1	.0	.0
						TAKEOFF	102.4	98.8	100.4	95.9	92.8	88.8	.0	.0
						APPROACH	109.5	100.4	104.4	100.7	96.7	93.7	99.7	96.1
79	WA	SEA		B-737-200	838	SIDELINE	104.4	100.4	103.2	95.5	91.4	86.4	.0	.0
						TAKEOFF	95.6	92.1	96.2	89.6	89.8	85.8	87.3	83.8
						APPROACH	111.5	99.1	103.1	99.2	95.3	92.3	101.6	85.8
79	WA	SEA		DC-10-10	939	SIDELINE	96.0	95.1	107.1	100.4	95.5	90.5	.0	.0
						TAKEOFF	99.0	94.6	105.8	100.2	96.7	92.7	88.9	84.5
						APPROACH	105.4	99.2	107.1	103.9	99.5	96.5	95.3	89.1
79	WA	SEA		AIRCRAFT TOTALS	9176	SIDELINE	104.6	101.6	105.1	97.9	93.4	88.4	81.5	81.5
						TAKEOFF	104.3	102.9	101.4	96.8	93.4	89.4	89.3	88.8
						APPROACH	111.8	109.1	104.8	101.2	97.1	94.1	101.0	96.6
79	WA	SEA		B-737-300C	573	SIDELINE	108.0	108.0	106.3	99.4	94.6	89.6	92.0	92.0
						TAKEOFF	114.0	114.0	103.7	100.6	95.3	91.3	101.2	101.2
						APPROACH	120.0	120.0	106.3	102.9	98.6	95.6	107.8	107.8

TABLE 1-1 (Continued)

SAMPLE OUTPUT FROM P2 PROGRAM

YR	AIR-LINE	AIR-PORT	C	AIRCRAFT TYPE	NO. FLTS	MODE	EMAX	EMIN	2	3	4	5	AMAX	AMIN
79	WA	SFO		B-720B	696	SIDELINE	108.0	108.0	105.3	98.1	93.6	88.6	92.0	92.0
						TAKEOFF	104.0	104.0	101.2	98.6	93.5	89.5	91.8	91.8
						APPROACH	117.0	117.0	105.3	101.8	97.6	94.6	104.8	104.8
79	WA	SFO		B-727-200	9308	SIDELINE	104.5	100.2	104.8	97.5	93.1	88.1	.0	.0
						TAKEOFF	102.4	98.8	100.4	95.9	92.8	88.8	.0	.0
						APPROACH	109.5	100.4	104.4	100.7	96.7	93.7	99.7	86.1
79	WA	SFO		B-737-200	4133	SIDELINE	104.4	100.4	103.2	95.5	91.4	86.4	.0	.0
						TAKEOFF	95.6	92.1	96.2	89.6	89.8	85.8	87.3	83.8
						APPROACH	111.5	99.1	103.1	99.2	95.3	92.3	101.6	85.8
79	WA	SFO		DC-10-10	980	SIDELINE	96.0	95.1	107.1	100.4	95.5	90.5	.0	.0
						TAKEOFF	99.0	94.6	105.8	100.2	96.7	92.7	88.9	84.5
						APPROACH	105.4	99.2	107.1	103.9	99.5	96.5	95.3	89.1
79	WA	SFO		AIRCRAFT TOTALS	15690	SIDELINE	104.7	101.6	104.7	97.5	93.0	88.0	81.1	81.1
						TAKEOFF	103.4	101.9	100.6	96.0	92.8	88.8	88.7	88.0
						APPROACH	111.8	108.3	104.5	100.8	96.8	93.8	101.2	95.9
79	WA	AIRPORT TOTALS			53486	SIDELINE	104.6	101.8	104.9	97.7	93.2	88.2	82.1	82.1
						TAKEOFF	103.8	102.5	101.0	96.4	93.1	89.1	89.6	85.0
						APPROACH	112.1	109.2	104.7	101.1	97.0	94.0	101.3	96.9
79	WE	SEA		B-737-200C	899	SIDELINE	103.0	103.0	103.2	95.5	91.4	86.4	.0	.0
						TAKEOFF	94.5	94.5	96.1	89.5	89.8	85.8	86.5	86.5
						APPROACH	111.5	111.5	103.2	99.4	95.4	92.4	101.6	101.6
79	WE	SEA		AIRCRAFT TOTALS	899	SIDELINE	103.0	103.0	103.2	95.5	91.4	86.4	.0	.0
						TAKEOFF	94.5	94.5	96.1	89.5	89.8	85.8	86.5	86.5
						APPROACH	111.5	111.5	103.2	99.4	95.4	92.4	101.6	101.6
79	WE	AIRPORT TOTALS			899	SIDELINE	103.0	103.0	103.2	95.5	91.4	86.4	.0	.0
						TAKEOFF	94.5	94.5	96.1	89.5	89.8	85.8	86.5	86.5
						APPROACH	111.5	111.5	103.2	99.4	95.4	92.4	101.6	101.6
79	AIRLINE TOTALS				1236324	SIDELINE	103.9	101.2	105.1	99.0	93.4	88.4	82.8	80.6
						TAKEOFF	106.6	104.3	101.7	97.3	93.6	89.6	95.3	92.7
						APPROACH	112.6	109.8	104.9	101.4	97.3	94.3	101.8	97.5
GRAND TOTALS					2664538	SIDELINE	100.6	97.9	101.7	94.6	90.1	85.1	79.5	77.3
						TAKEOFF	103.2	101.0	98.4	94.0	90.2	86.2	92.0	89.3
						APPROACH	108.7	105.7	101.6	98.0	93.9	90.9	98.4	94.2

information is much more detailed than the aircraft information given in the Civil Aernautics Poard (CAB) reports on airport activity (Reference 7), which does not give the engines installed in the aircraft types, the parameter file contains a maximum and a minimum value. These values are the noise levels for the noisest and quietest engine installations and thus cover the total range of variation in noise levels for a particular type of aircraft. References 4 and 5 give noise levels in EPNdB, and Reference 6 gives noise levels in A-weighted decibels.

With the preceding explanation in mind, one can again refer to Table 1 for the remainder of the information provided in the output of P2. The column heading "mode" refers to the three FAR Part 36 measuring points, "EMAX" refers to the highest noise level in EPNdB for that type of aircraft, "EMIN" refers to the lowest noise level in EPNdB for that type of aircraft, "2", "3", and "5" refer to noise levels that would obtain under compliance with various stages of FAR 36: 1969 FAR 36 (prescribed), Stage 2; 1975 FAR 36 (prescribed), Stage 3; 1980 FAR 36 (proposed), Stage 4; and 1985 FAR 36 (proposed), Stage 5. The columns headed "AMAX" and "AMIN" provide maximum and minimum values for A-weighted decibels.

With the column headings explained, we may now turn to the row headings. Examination of Table 1 will show that the output reproduces the data from the airport activity statistics under the first six column headings; that is, each third row or line gives the number of departures for each combination of year, airline, cargo, and type of aircraft. The data from the parameter file are reporduced under the remaining nine column headings for every type of aircraft on every row of the report. This pattern is maintained until a year-airline-airport combination has been exhausted, at which time the total number of departures from a particular airport will be printed by the row heading "AIRCRAFT TOTALS" with the corresponding FNLs in the following columns. It may clarify the meaning "AIRCRAFT TOTALS" to think of the heading as "TOTAL OF AIRCRAFT DEPARTURES FOR THIS AIRPORT AND THIS AIRLINE".

The same process is repeated until airports have been read for that particular airline, at which time a total number of departures and the corresponding FNLs for the airline over all airports will be printed by the row heading "AIRPORT TOTALS". Again it may clarify the meaning of this heading

somewhat to think of it as "TOTAL OF AIRCRAFT DEPARTURES AT ALL AIRPORTS FOR THIS AIRLINE". The same process then begins again with a different airline until all airlines have been exhausted, at which time the total departures and FNLs for the year are printed by the heading "AIRLINE TOTALS". If data for more than one year are in the input data file, the row heading "GRAND TOTALS" will indicate total departures and FNLs for all of the years. It is possible to eliminate some row headings and prevent calculation of the quantities they indicate. The method for doing this can be found in a later section of this manual.

P3 and P3F

These two programs calculate ANI for each year-airport combination. That is, for a particular year the output will contain ANIs for every airport in the input data file. Information on airlines or types of aircraft will not be presented in the output. A sample calculation is given in Table 2. The information is arranged in basically the same way it is arranged in the output of P2 except that there are fewer row headings because much less information is given.

P4 and P4F

The arrangement of the output for this program is very similar to the arrangement for P2 and P2F. However the columns for AMAX and AMIN have been deleted, and all but one of the remaining columns now contain differences. Comparing Table 1 with Table 3 will show that only the data under the heading "2" remain unchanged. The other columns are the differences between the values shown in Table 1 and the values in column "2". In other words, the values of column "2" have been subtracted from all of the other columns to arrive at the data shown in Table 3. Any of the six columns can be subtracted from all of the others, and instructions on how to determine which column is used as the subtrahend for calculating the remaining columns are provided in the operating instructions for the program.

TABLE 1-2

SAMPLE OUTPUT FROM P3 PROGRAM

YR	AIR-PORT		NO. FLTS	MODE	FMAX	EMIN	2	3	4	5	AMAX	AMIN
79	IAD	AIRPORT NOISE IND	23777	SIDELINE	70.2	69.1	70.6	63.7	59.0	54.0	47.7	45.8
				TAKEOFF	75.2	74.0	67.8	63.9	59.5	55.5	63.7	62.0
				APPROACH	79.9	78.9	70.6	67.1	63.0	60.0	68.7	67.2
79	JFK	AIRPORT NOISE IND	87162	SIDELINE	75.3	73.8	76.9	70.4	65.5	60.5	54.1	52.8
				TAKEOFF	81.8	78.9	75.0	71.3	66.5	62.5	71.3	67.5
				APPROACH	85.4	83.8	76.9	73.6	69.4	66.4	74.5	72.0
79	LAX	AIRPORT NOISE IND	160300	SIDELINE	77.5	75.2	78.9	72.0	67.3	62.3	56.9	55.2
				TAKEOFF	80.7	77.9	76.1	71.8	67.7	63.7	69.7	66.2
				APPROACH	86.9	83.4	78.8	75.3	71.2	68.2	75.3	71.6
79	MIA	AIRPORT NOISE IND	94649	SIDELINE	74.6	71.8	76.3	69.2	64.7	59.7	55.3	52.9
				TAKEOFF	77.3	75.5	73.1	68.4	64.9	60.9	65.8	63.9
				APPROACH	82.5	79.3	76.2	72.7	68.5	65.5	72.3	68.1
79	ORD	AIRPORT NOISE IND	258341	SIDELINE	79.6	77.0	80.5	73.4	68.9	63.9	58.1	55.7
				TAKEOFF	81.7	79.7	77.1	72.7	69.0	65.0	70.3	68.0
				APPROACH	87.6	84.8	80.4	76.8	72.7	69.7	77.3	73.2
79	SEA	AIRPORT NOISE IND	60800	SIDELINE	72.7	69.5	74.6	67.6	63.0	58.0	54.1	51.5
				TAKEOFF	76.1	73.0	71.8	67.3	63.4	59.4	65.3	61.7
				APPROACH	80.6	76.5	74.4	71.0	66.8	63.8	70.6	68.9
79	SFO	AIRPORT NOISE IND	117692	SIDELINE	76.4	74.0	77.3	70.3	65.7	60.7	55.8	53.6
				TAKEOFF	79.3	77.1	74.1	69.9	65.9	61.9	68.3	65.6
				APPROACH	84.7	82.0	77.1	73.6	69.5	66.5	74.1	70.2

TABLE 1-3

SAMPLE OUTPUT FROM P4 PROGRAM

YR	AIR-LINE	AIR-PORT	C	AIRCRAFT TYPE	NO. FLTS	MODE	EMAX	EMIN	2	3	4	5
79	WA	LAX		DC-10-10	2848	SIDELINE	-11.1	-12.0	107.1	-6.7	-11.6	-16.6
						TAKEOFF	-6.8	-11.2	105.8	-5.6	-9.1	-13.1
						APPROACH	-1.7	-7.9	107.1	-3.2	-7.6	-10.6
79	WA	LAX		AIRCRAFT TOTALS	27394	SIDELINE	-.1	-2.7	104.8	-7.2	-11.7	-16.7
						TAKEOFF	2.9	1.8	100.9	-4.7	-7.9	-11.9
						APPROACH	7.8	5.1	104.6	-3.6	-7.7	-10.7
79	WA	MIA		B-707-300C	67	SIDELINE	1.7	1.7	106.3	-6.9	-11.7	-16.7
						TAKEOFF	10.3	10.3	103.7	-3.1	-8.4	-12.4
						APPROACH	13.7	13.7	106.3	-3.4	-7.7	-10.7
79	WA	MIA		B-720B	49	SIDELINE	2.7	2.7	105.3	-7.2	-11.7	-16.7
						TAKEOFF	2.8	2.8	101.2	-2.6	-7.7	-11.7
						APPROACH	11.7	11.7	105.3	-3.5	-7.7	-10.7
79	WA	MIA		DC-10-10	772	SIDELINE	-11.1	-12.0	107.1	-6.7	-11.6	-16.6
						TAKEOFF	-6.8	-11.2	105.8	-5.6	-9.1	-13.1
						APPROACH	-1.7	-7.9	107.1	-3.2	-7.6	-10.6
79	WA	MIA		AIRCRAFT TOTALS	888	SIDELINE	-6.3	-6.5	107.0	-6.7	-11.6	-16.6
						TAKEOFF	-1.2	-1.9	105.5	-5.4	-9.0	-13.0
						APPROACH	4.3	3.5	107.0	-3.2	-7.6	-10.6
79	WA	SEA		B-707-300C	457	SIDELINE	1.7	1.7	106.3	-6.9	-11.7	-16.7
						TAKEOFF	10.3	10.3	103.7	-3.1	-8.4	-12.4
						APPROACH	13.7	13.7	106.3	-3.4	-7.7	-10.7
79	WA	SEA		B-720B	358	SIDELINE	2.7	2.7	105.3	-7.2	-11.7	-16.7
						TAKEOFF	2.8	2.8	101.2	-2.6	-7.7	-11.7
						APPROACH	11.7	11.7	105.3	-3.5	-7.7	-10.7
79	WA	SEA		B-727-200	6594	SIDELINE	-.3	-4.6	104.8	-7.3	-11.7	-16.7
						TAKEOFF	2.0	-1.6	100.4	-4.5	-7.6	-11.6
						APPROACH	5.1	-4.0	104.4	-3.7	-7.7	-10.7
79	WA	SEA		B-737-200	838	SIDELINE	1.2	-2.8	103.2	-7.7	-11.8	-16.8
						TAKEOFF	-.6	-4.1	96.2	-6.6	-6.4	-10.4
						APPROACH	8.4	-4.0	103.1	-3.3	-7.8	-10.8
79	WA	SEA		DC-10-10	929	SIDELINE	-11.1	-12.0	107.1	-6.7	-11.6	-16.6
						TAKEOFF	-6.8	-11.2	105.8	-5.6	-9.1	-13.1
						APPROACH	-1.7	-7.9	107.1	-3.2	-7.6	-10.6
79	WA	SEA		AIRCRAFT TOTALS	9176	SIDELINE	-.5	-3.5	105.1	-7.2	-11.7	-16.7
						TAKEOFF	2.9	1.5	101.4	-4.6	-8.0	-12.0
						APPROACH	6.9	4.2	104.8	-3.6	-7.7	-10.7
79	WA	SFO		B-707-300C	573	SIDELINE	1.7	1.7	106.3	-6.9	-11.7	-16.7
						TAKEOFF	10.3	10.3	103.7	-3.1	-8.4	-12.4
						APPROACH	13.7	13.7	106.3	-3.4	-7.7	-10.7

TABLE 1-3

SAMPLE OUTPUT FROM P4 PROGRAM

YR	AIR-LINE	AIR-PORT	C	AIRCRAFT TYPE	NO. FLTS	MODE	EMAX	EMIN	2	3	4	5
79	WA	SFO		B-720B	696	SIDELINE	2.7	2.7	105.3	-7.2	-11.7	-16.7
						TAKEOFF	2.8	2.8	101.2	-2.6	-7.7	-11.7
						APPROACH	11.7	11.7	105.3	-3.5	-7.7	-10.7
79	WA	SFO		B-727-200	9308	SIDELINE	-.3	-4.6	104.8	-7.3	-11.7	-16.7
						TAKEOFF	2.0	-1.6	100.4	-4.5	-7.6	-11.6
						APPROACH	5.1	-4.0	104.4	-3.7	-7.7	-10.7
79	WA	SFO		B-737-200	4133	SIDELINE	1.2	-2.8	103.2	-7.7	-11.8	-16.8
						TAKEOFF	-.6	-4.1	96.2	-6.6	-6.4	-10.4
						APPROACH	8.4	-4.0	103.1	-3.9	-7.8	-10.8
79	WA	SFO		DC-10-10	980	SIDELINE	-11.1	-12.0	107.1	-6.7	-11.6	-16.6
						TAKEOFF	-6.8	-11.2	105.8	-5.6	-9.1	-13.1
						APPROACH	-1.7	-7.9	107.1	-3.2	-7.6	-10.6
79	WA	SFO		AIRCRAFT TOTALS	15690	SIDELINE	-.1	-3.1	104.7	-7.3	-11.7	-16.7
						TAKEOFF	2.9	1.3	100.6	-4.6	-7.8	-11.8
						APPROACH	7.3	3.9	104.5	-3.6	-7.7	-10.7
79	WA	AIRPORT TOTALS			53486	SIDELINE	-.2	-3.0	104.9	-7.2	-11.7	-16.7
						TAKEOFF	2.8	1.5	101.0	-4.7	-8.0	-12.0
						APPROACH	7.4	4.6	104.7	-3.6	-7.7	-10.7
79	WE	SEA		B-737-200C	899	SIDELINE	-.2	-.2	103.2	-7.7	-11.8	-16.8
						TAKEOFF	-1.6	-1.6	96.1	-6.6	-6.3	-10.3
						APPROACH	8.3	8.3	103.2	-3.8	-7.8	-10.8
79	WE	SEA		AIRCRAFT TOTALS	899	SIDELINE	-.2	-.2	103.2	-7.7	-11.8	-16.8
						TAKEOFF	-1.6	-1.6	96.1	-6.6	-6.3	-10.3
						APPROACH	8.3	8.3	103.2	-3.8	-7.8	-10.8
79	WE	AIRPORT TOTALS			899	SIDELINE	-.2	-.2	103.2	-7.7	-11.8	-16.8
						TAKEOFF	-1.6	-1.6	96.1	-6.6	-6.3	-10.3
						APPROACH	8.3	8.3	103.2	-3.8	-7.8	-10.8
79	AIRLINE TOTALS				1236324	SIDELINE	-1.1	-3.8	105.1	-7.1	-11.6	-16.6
						TAKEOFF	4.8	2.6	101.7	-4.4	-8.1	-12.1
						APPROACH	7.1	4.1	104.8	-3.5	-7.6	-10.6
GRAND TOTALS					2664538	SIDELINE	-1.1	-3.8	101.7	-7.1	-11.6	-16.6
						TAKEOFF	4.8	2.6	98.4	-4.4	-8.1	-12.1
						APPROACH	7.1	4.1	101.6	-3.5	-7.6	-10.6

P5 and P5F

The output from these programs is very similar to the output from P3 and P3F except that both FNLs and ANIs are calculated, and the information is given on the basis of airlines rather than airports. Table 4 provides a sample output from these programs.

TABLE 1-4

SAMPLE OUTPUT FROM P5 PROGRAM

YR	AIR-LINE		NO. FLTS	MODE	EMAX	EMIN	2	3	4	5	AMAX	AMIN
79	TI	FLEET NOISE LEVEL	2058	SIDELINE	102.4	97.8	102.7	94.8	90.9	85.9	.0	.0
				TAKEOFF	93.6	90.3	95.0	89.2	88.9	84.9	80.9	77.6
				APPROACH	109.6	107.9	102.7	98.7	94.8	91.8	102.2	100.8
		AIRLINE NOISE INDEX		SIDELINE	56.9	52.4	57.2	49.3	45.4	40.4	45.5	45.5
				TAKEOFF	48.1	44.8	49.5	43.7	43.4	39.4	35.4	32.1
				APPROACH	64.1	62.4	57.2	53.2	49.3	46.3	56.7	55.3
79	TV	FLEET NOISE LEVEL	93	SIDELINE	108.9	108.9	105.8	98.8	94.2	89.2	.0	.0
				TAKEOFF	112.9	112.9	102.5	99.4	94.3	90.3	74.0	69.6
				APPROACH	110.9	110.9	105.8	102.4	98.2	95.2	80.4	74.2
		AIRLINE NOISE INDEX		SIDELINE	49.9	49.9	46.8	39.8	35.2	30.2	58.9	58.9
				TAKEOFF	53.9	53.9	43.5	40.5	35.4	31.4	15.0	10.6
				APPROACH	52.0	51.9	46.8	43.4	39.2	36.2	21.4	15.2
79	TW	FLEET NOISE LEVEL	90979	SIDELINE	105.4	104.6	105.7	98.8	94.1	89.1	83.3	81.3
				TAKEOFF	107.8	106.7	102.8	98.9	94.5	90.5	96.2	94.5
				APPROACH	114.9	114.2	105.6	102.2	98.0	95.0	103.3	102.2
		AIRLINE NOISE INDEX		SIDELINE	76.4	75.5	76.7	69.7	65.1	60.1	54.2	52.2
				TAKEOFF	78.8	77.6	73.8	69.9	65.5	61.5	67.2	65.5
				APPROACH	85.8	85.2	76.6	73.2	69.0	66.0	74.2	73.1
79	UA	FLEET NOISE LEVEL	187672	SIDELINE	103.8	101.1	105.1	98.1	93.5	88.5	84.3	81.4
				TAKEOFF	108.5	106.6	101.9	97.7	93.7	89.7	97.9	95.8
				APPROACH	112.5	108.7	105.0	101.5	97.4	94.4	102.2	97.4
		AIRLINE NOISE INDEX		SIDELINE	78.0	75.2	79.3	72.2	67.6	62.6	58.4	55.5
				TAKEOFF	82.6	80.7	76.0	71.8	67.8	63.8	72.0	69.9
				APPROACH	86.6	82.8	79.1	75.6	71.5	68.5	76.3	71.5
79	VA	FLEET NOISE LEVEL	53486	SIDELINE	104.6	101.8	104.9	97.7	93.2	88.2	82.1	82.1
				TAKEOFF	103.8	102.5	101.0	96.4	93.1	89.1	89.6	89.0
				APPROACH	112.1	109.2	104.7	101.1	97.0	94.0	101.3	96.9
		AIRLINE NOISE INDEX		SIDELINE	73.3	70.5	73.5	66.3	61.8	56.8	50.8	50.8
				TAKEOFF	72.5	71.2	69.7	65.0	61.7	57.7	58.3	57.6
				APPROACH	80.8	77.9	73.3	69.7	65.6	62.6	70.0	65.6
79	WE	FLEET NOISE LEVEL	899	SIDELINE	103.0	103.0	103.2	95.5	91.4	86.4	.0	.0
				TAKEOFF	94.5	94.5	96.1	89.5	89.8	85.8	86.5	86.5
				APPROACH	111.5	111.5	103.2	99.4	95.4	92.4	101.6	101.6
		AIRLINE NOISE INDEX		SIDELINE	53.9	53.9	54.1	46.4	42.3	37.3	49.1	49.1
				TAKEOFF	45.4	45.4	47.0	40.4	40.7	36.7	37.4	37.4
				APPROACH	62.4	62.4	54.1	50.3	46.3	43.3	52.5	52.5

II. OPERATION OF THE FNL PROGRAM

This section will provide detailed instructions on how to operate the FNL program. The assumptions about the knowledge the user will bring with him are given in the User Profile section. The instructions will lead the user step-by-step through the choice points in the program and tell him what results his choices will have. All users should read the instructions for using P2 and P2F, for mnay of the operating instructions are not repeated for later programs in the series. The following conventions will beused in presenting interactive dialog with the program. Lower case letters underlined indicate prompts received from the program, and upper case letters indicate responses of the user. The symbol "*" indicates that addition instructions will be found in a footnote. See Appendix A for a sample log-on sequence.

PRELIMINARY CONSIDERATIONS

Since files are removed from active storage and placed in an archive (stored on tape) at regular intervals, it will be necessary to dearchive three files to make the program work. These files are:

- CN.EPATFP.MUSN.$NOISE.CLIST
- CN.EPATFP.MUSN.LOADLIB
- CN.EPA.MUSN.NOISE.CNTL.

These files contain the program itself and the control language necessary. to operate the program.

Two input data files are also necessary for operation of the program, a parameter file, which contains information on the noise characteristics of aircraft in the U.S. air carrier fleet, and an aircraft data file, which contains operations data on the U.S. airfleet. The name of the parameter file is:

- CN.EPATFP.MUSN.CPARAM.DATA

A copy of CPARAM.DATA is reproduced in Appendix D. Two air data files exist that will allow the program to operate. They are:

- CN.EPATFP.MUSN.CABAPTJT.DATA
- CN.EPATFP.MUSN.CTAPORT.DATA

The former contains operations data on all U.S. airports taken from Table 7 of Reference 8. The latter contains operations data on ten U.S. airports* for 1978 and 1979 taken from Table 7 of References 7 and 8. An excerpt from CTAPORT.DATA is reproduced in Appendix E. Allow NCC an overnight period to load these files into active storage, and the program will be ready to run the next morning. See Appendix C for instructions on how to de-archive a file.

Since the job control language (JCL) as it exists in the present program will not have a currently valid account number, you must change the JCL immediately after the prompt "ready" appears on your terminal. The following sequence shows how to make this change, which need only be made the first time you use the program.

```
ready
EDIT 'CN.EPATFP.MUSN.NOISE.CNTL'
qed
CHANGE 100/MUSN/XXXX/
qed
SAVE
saved
END
ready
```

*The ten airports are: ATL, BOS, DCA, IAD, JFK, LAX, MIA, ORD, SEA, AND SFO.

P2 AND P2F

The following instructions will enable the user to operate programs P2 and P2F. These are the instructions that resulted in the sample output of Table 1.

ready
EXEC 'CN.EPATFP.MUSN.$NOISE.CLIST'*
enter program name: P2
enter param filename: CPARAM**
enter airdat filename: CTAPORT** ***
save output (y/n)?Y****
print output (y/n)?Y *****
enter printer flile name: DUMB020**
control card

---

*This instruction assumes that the user has entered the system on an identification number and account number other than EPATFP, MUSN. If the user enters on these identification and account numbers or changes the program to his own numbers, then the reply would simply be "EXEC $NOISE".

**Note that the complete suffix (CPARAM.DATA) is not used. The program adds ".DATA" to all file names entered. If the user enters ".DATA" a JCL error will result because the program will not be able to find "CPARAM.DATA.DATA". This footnote also applies to the two other user-supplied file names.

***This file contains operations data for ten airports during the calendar years 1978 and 1979. A partial listing of the file can be found in Appendix E.

****A response of yes here will result in the creation of an output file on disk storage with the data set name provided in the reply after next. In this instance the complete data set name will be CN.EPATFP.MUSN.DUMB020.DATA.

*****A response of yes to this prompt will result in routing the output to a printer at the NCC facility, from whence it will be mailed to the user. If the user wishes the printout routed some other printer, consult the NCC user support to find out how the program can be modified to this. It should be noted that a response of no to both questions will result in routing the output to a printer at the NCC facility and subsequent mailing to the user.

```
.........1.........2.........3.........4.........5.........6.........7....7
12345678901234567890123456789012345678901234567890123456789012345678901234
```

[The spaces enclosed by these brackets are available for a title*.]

```
are all fields correct(y/n)?Y**
end of data
saved
saved
job epatfp(job0nnnn) submitted
entry (a) cn.epatfp.musn.temp.cntl deleted
ready
```

At this point the system is ready for entry of another run or for LOGOFF.

The preceding discussion omitted one aspect of the sequence of prompts and replies, the last five columns of the control card. Since the use of these columns to control the output of the program is a refinement and is not essential to its operation, explanation of their use is deferred to Appendix B.

P3 AND P3F

These two programs are operated in the same way as P2 and P2F with one exception. All 80 columns of the control card are available for use as a title; there are no control options that allow the user to change the output of the program.

P4 AND P4F

Again these two programs are operated in the same way as P2 and P2F with the exception of the control card. The function of the control card remains identical through column 75 (see Appendix B), but column 76 must be used

*Do not use an ampersand (&) in a title. If an ampersand is used, the program will return to the "ready" prompt, and the user will have to begin the program operation sequence anew.

**If the user replies "N", the program operation sequence starts over again at the beginning. This is a very useful feature if you have made an error an cannot correct it. If, for example, you have entered the wrong program name but you do not catch the error until you have already skipped to the next line, simply keep pressing the "RETURN" key until you reach this line and enter "N".

to subtract one of the columns (the subtrahend) from all of the others.* The following list shows the digits used to control the output.

Column 76	Subtrahend Column
1	EMAX
2	EMIN
3	2
4	3
5	4
6	5

Referring to Table 3, it is obvious that the values in the "2" column have been subtracted from all of the others. To achieve this result the number "3" was entered in column 76.

P5 AND P5F

The operation of these two programs is identical to the operation of P3 and P3F.

*The number 76 is not shown on the display, but it is there nonetheless. Simply move the pointer until it rests under 75, then press the space bar once more. A value can now be put in column 76.

III. SUMMARY

This report provides detailed instructions for using a program developed for automated calculation of Fleet Noise Levels (FNLs) and Airport Noise Indices (ANIs) for airports and airlines on a yearly basis. The user is assumed to have only the most rudimentary knowledge of computer techniques. A basic summary of the quantities calculated by the program are described, and brief excerpts of the output of the program are provided in Tables.

IV. REFERENCES

1. "National Air Carrier Fleet Noise Levels", William C. Sperry, EPA 550/9-81-nnn, Office of Noise Abatement and Control, U.S. Environmental Protection Agency, in preparation.

2. "Generation of a Data Base and Determination of a Set of AVports for Air Carrier Airports", Larry A. Ponk, William Benson, and Richard I. Chais, ORI TR-1931, July 1981.

3. "NCC-IBM User's Guide", National Computer Center, Management Information and Data Systems Division, U.S. Environmental Protection Agency, October 1980

4. "Advisory Circular", Number 36-1B, Federal Aviation Administration, Department of Transportation, December 5, 1977.

5. "Advisory Circular", Number 36-2A, "Advisory Circular", Number 36-1B, Federal Aviation Administration, Department of Transportation, February 6, 1978.

6. "Advisory Circular, Number 36-3A, "Advisory Circular", Number36-1B, Federal Aviation Administration, Department of Transportation, June 11, 1980.

7. "Airport Activity Statistics of Certificated Route Air Carriers", Calendar Year 1978, Federal Aviation Administration, Department of Transportation and Civil Aeronautics Board, 1979.

8. "Airport Activity Statistics of Certificated Route Air Carriers", Calendar Year 1979, Federal Aviation Administration, Department of Transportation and Civil Aeronatuics Board, 1980.

APPENDIX A

SAMPLE LOG-ON PROCEDURES FOR THE NATIONAL COMPUTER CENTER (NCC)

APPENDIX A

If the user is to establish contact with the NCC system by means of a telephone connection, he must obtain a list of telephone numbers that he can use from the NCC. Once the user is connected to NCC, the log-on procedures in the following paragraph will currently work. As in the previous sections of the text, lower case letters underlined indicate the prompt received from the system, and upper case letters indicate the users response. Spaces indicate spaces. The use of "N" or "n" indicates that a numeric character has been sent or received, and the use of "X" or "x" indicates that an alphabetic character has been sent or received. The symbol "*" indicates that additional instructions will be found in a footnote.

please type your terminal identifier A

-nnnn-nnn-

please log in: *IBMEPA1;NCC

x n

ibmn is on line

TSO

---

*The user should simultaneously press the two keys "CTRL" and "H". This will cause the terminal to backspace once and will prevent his following input from "echoing" (IIBBMMEEPPAA11;;NNCCCC). If an error is made on this line for example, EPAIBM1) the following sequence of prompts and responses should be made.

error, type user name: IBMEPA1

password:

NCC

This sequence will have to be followed even though the original erroneous entry was corrected on the screen before pressing the "RETURN" key.

enter logon for tso or wylbur terminal type

LOGON EPATFP/XXXXXX**

ready

**A six character password is typed here.

APPENDIX B

USE OF CONTROL CARD COLUMNS 71-75 TO CONTROL THE OUTPUT OF P2, P2F, P4, AND P4F

APPENDIX B

Table B-1 provides a summary of how columns 71-75 in the control card (the spaces remaining after the spaces reserved for a title) can be used to control the output of the P2 program. If all five columns are left blank, the output will be the same as it appears in Table 1. Columns 71-75 are used to selectively delete parts of this total output. Note that "0" is used to represent any alphabetic or numeric character.

TABLE B-1

SUMMARY OF CONTROL CARD INPUTS USED TO CONTROL OUTPUT
P2, P2F, P4, and P4F

Column	Input*	Variable Affected	Effect
71	0	Aircraft type	Data on particular aircraft types will not be printed; total operations for a particular airline at each airport will be printed.
72	S	Airport	Data on particular airports will no longer be printed; total operations and FNLs for a particular airline at all airports will be printed.
73	S	Airline	Data on particular airlines will no longer be printed; total operations at a particular airport for all airlines will be printed.
74	S	Year	Data for more than one year will be combined.
75	0	Grand total	Total over years will not be printed.

*"0" is used to represent any alphabetic or numeric character.

APPENDIX C

INSTRUCTIONS FOR DE-ARCHIVING FILES

APPENDIX C

```
ready
TSOWYL
command?
USE $SYS3.UTILITY.DATA(DEARC) CLEAR
command?
LIST
1.      /* dearchive archived d.s.
2.      /* cntl sysarch, shr
3.      /* asm2 data sets only
4.      // step 01 exec asm2retu
5.      // sysin dd *
6.      //
7.      $ra 'data set name'
8.      $ra 'data set name'
command?
Insert 0.1
0.1? EPAXXX† JOB (YYYY††  MLYR) 'YOUR NAME'
command?
DELETE 8
```

†XXX is your identification at NCC.

††YYYY is your account number at NCC.

command?
CHANGE 'DATA SET NAME' TO 'EN.EPATFP.MUSN.$NOISE.CLIST' IN 7
command?
RUN HOLD
your job number is nnnn

Continue the process of substituting the data set name you wish for the dummy data set name until jobs have been submitted for all of the files you will need. The following commands should be given after this has been done.

command? END
ready LOGOFF

APPENDIX D

COPY OF CPARAM.DATA

TABLE D

AIRCRAFT NOISE DATA IN CPARAM.DATA

1.	SIDELINE A-300B	95.3	90.7	106.8	99.0	94.4	89.4			
2.	TAKEOFF A-300B	90.5	87.0	104.0	95.8	95.5	91.5	79.4	75.9	
3.	APPROACH A-300B	101.9	100.8	106.3	102.9	98.6	95.6	91.5	90.0	1
4.	SIDELINE B-707-100B	108.0	108.0	105.6	98.5	93.9	88.9			
5.	TAKEOFF B-707-100B	108.0	108.0	101.9	99.1	93.9	89.9	95.8	95.8	3
6.	APPROACH B-707-100B	118.0	118.0	105.6	102.1	97.9	94.9	105.8	105.8	3
7.	SIDELINE B-707-300	110.0	110.0	106.1	99.2	94.5	89.5			
8.	TAKEOFF B-707-300	107.0	107.0	103.4	100.3	95.0	91.0	98.6	98.6	4
9.	APPROACH B-707-300	108.0	108.0	106.1	102.7	98.5	95.5	98.6	98.6	4
10.	SIDELINE B-707-300B	108.0	108.0	106.3	99.3	94.6	89.6			
11.	TAKEOFF B-707-300B	113.0	113.0	103.6	100.5	95.2	91.2	100.8	100.8	5
12.	APPROACH B-707-300B	119.9	119.0	106.3	102.9	98.6	95.6	106.8	106.8	5
13.	SIDELINE B-707-300C	108.0	108.0	106.3	99.4	94.6	89.6	92.0	92.0	6
14.	TAKEOFF B-707-300C	114.0	114.0	103.7	100.6	95.3	91.3	101.2	101.2	6
15.	APPROACH B-707-300C	120.0	120.0	106.3	102.9	98.6	95.6	107.8	107.8	6
16.	SIDELINE B-720B	108.0	108.0	105.3	98.1	93.6	88.6	92.0	92.0	7
17.	TAKEOFF B-720B	104.0	104.0	101.2	98.6	93.5	89.5	91.8	91.8	7
18.	APPROACH B-720B	117.0	117.0	105.3	101.8	97.6	94.6	104.8	104.8	7
19.	SIDELINE B-727-100	102.0	99.1	104.4	96.9	92.6	87.6	91.3	88.4	8
20.	TAKEOFF B-727-100	100.0	96.0	98.5	94.4	91.5	87.5	90.8	86.4	8
21.	APPROACH B-727-100	110.0	98.9	104.2	100.5	96.4	93.4	100.2	89.1	8
22.	SIDELINE B-727-100C	100.0	100.0	104.2	96.7	92.4	87.4			
23.	TAKEOFF B-727-100C	96.5	96.5	98.5	94.4	91.5	87.5	87.3	87.3	10
24.	APPROACH B-727-100C	110.0	110.0	104.2	100.5	96.4	93.4	100.2	100.2	10
25.	SIDELINE B-727-200	104.5	100.2	104.8	97.5	93.1	88.1			
26.	TAKEOFF B-727-200	102.4	98.8	100.4	95.9	92.8	88.8			
27.	APPROACH B-727-200	109.5	100.4	104.4	100.7	96.7	93.7	99.7	86.1	9
28.	SIDELINE B-737-200	104.4	100.4	103.2	95.5	91.4	86.4			11
29.	TAKEOFF B-737-200	95.6	92.1	96.2	89.6	89.8	85.8	87.3	83.8	11
30.	APPROACH B-737-200	111.5	99.1	103.1	99.2	95.3	92.3	101.6	85.8	11
31.	SIDELINE B-737-200C	103.0	103.0	103.2	95.5	91.4	86.4			12
32.	TAKEOFF B-737-200C	94.5	94.5	96.1	89.5	89.8	85.8	86.5	86.5	12
33.	APPROACH B-737-200C	111.5	111.5	103.2	99.4	95.4	92.4	101.6	101.6	12
34.	SIDELINE B-747	103.3	96.0	108.0	102.6	97.3	92.3			13
35.	TAKEOFF B-747	115.0	99.5	108.0	105.0	99.2	95.2	105.7	94.1	13
36.	APPROACH B-747	114.8	103.4	108.0	105.0	101.1	98.1	105.8	94.4	13
37.	SIDELINE B-747C	103.3	96.0	108.0	102.6	97.3	92.3			
38.	TAKEOFF B-747C	115.0	99.5	108.0	105.0	99.2	95.2	105.7	94.1	14
39.	APPROACH B-747C	114.8	103.4	108.0	105.0	101.1	98.1	105.8	94.4	14
40.	SIDELINE B-747F	103.3	96.0	108.0	102.6	97.3	92.3			16
41.	TAKEOFF B-747F	115.0	99.5	108.0	105.0	99.2	95.2	105.7	94.1	16
42.	APPROACH B-747F	114.8	103.4	108.0	105.0	101.1	98.1	105.8	94.4	16
43.	SIDELINE B-747SP	99.5	98.9	108.0	102.1	96.9	91.9	86.8	86.2	15
44.	TAKEOFF B-747SP	105.7	104.4	108.0	104.8	99.1	95.1	96.2	94.9	15
45.	APPROACH B-747SP	104.1	103.4	108.0	105.0	100.9	97.9	93.5	92.8	15
46.	SIDELINE BAC-111-200	102.4	102.4	102.8	94.9	91.6	86.0			2
47.	TAKEOFF BAC-111-200	94.2	94.2	95.0	89.6	88.2	84.9	90.5	82.3	2
48.	APPROACH BAC-111-200	102.4	102.4	102.8	98.8	95.0	92.0	98.6	95.3	2
49.	SIDELINE DC-10-10	96.0	95.1	107.1	100.4	95.5	96.5			27
50.	TAKEOFF DC-10-10	99.0	94.5	105.8	100.2	96.7	92.7	88.9	84.5	27

TABLE D (continued)

AIRCRAFT NOISE DATA IN CPARAM.DATA

51.	APPROACH	DC-10-10	105.4	99.2	107.1	103.9	99.5	96.5	95.3	89.1	27
52.	SIDELINE	DC-10-30	99.9	95.7	107.7	101.3	96.2	91.2	88.1	83.9	28
53.	TAKEOFF	DC-10-30	105.3	100.2	107.9	101.9	98.3	94.3	95.4	90.3	28
54.	APPROACH	DC-10-30	109.6	102.6	107.9	104.8	100.4	97.4	99.2	92.2	28
55.	SIDELINE	DC-10-40	97.8	94.3	107.8	101.3	96.2	91.2	86.0	82.5	29
56.	TAKEOFF	DC-10-40	102.9	98.4	107.9	101.9	98.3	94.3	92.7	85.6	29
57.	APPROACH	DC-10-40	106.6	98.5	107.9	104.8	100.4	97.4	96.5	88.4	29
58.	SIDELINE	DC-8-10	109.0	109.0	105.7	98.7	94.1	89.1			
59.	TAKEOFF	DC-8-10	113.0	113.0	102.3	99.4	94.2	90.2			
60.	APPROACH	DC-8-10	111.0	111.0	105.7	102.3	98.1	95.1			
61.	SIDELINE	DC-8-20	111.0	111.0	105.8	98.7	94.1	89.1			
62.	TAKEOFF	DC-8-20	105.0	105.0	102.4	99.5	94.3	90.3			
63.	APPROACH	DC-8-20	111.0	111.0	105.8	102.3	98.1	95.1			
64.	SIDELINE	DC-8-50	106.0	106.0	106.0	99.0	94.3	89.3			18
65.	TAKEOFF	DC-8-50	115.0	114.0	103.4	100.3	95.0	91.0	104.2	103.2	18
66.	APPROACH	DC-8-50	118.0	116.0	106.1	102.7	98.5	95.5	106.8	104.8	18
67.	SIDELINE	DC-8-50F	106.0	106.0	106.0	99.0	94.3	89.3			19
68.	TAKEOFF	DC-8-50F	115.0	114.0	103.4	100.3	95.0	91.0	104.2	103.2	19
69.	APPROACH	DC-8-50F	118.0	116.0	106.1	102.7	98.5	95.5	106.8	104.8	19
70.	SIDELINE	DC-8-61	106.0	106.0	106.3	99.3	94.6	89.6			20
71.	TAKEOFF	DC-8-61	116.0	116.0	103.6	100.5	95.2	91.2	105.2	105.2	20
72.	APPROACH	DC-8-61	118.0	118.0	106.3	102.9	98.6	95.6	106.8	106.8	20
73.	SIDELINE	DC-8-62	106.0	104.0	106.4	99.6	94.8	89.8			21
74.	TAKEOFF	DC-8-62	115.0	112.0	104.1	100.9	95.5	91.5	104.2	101.2	21
75.	APPROACH	DC-8-62	115.0	112.0	106.4	103.1	98.8	95.8	103.8	100.8	21
76.	SIDELINE	DC-8-63F	106.0	104.0	106.5	99.6	94.9	89.9			22
77.	TAKEOFF	DC-8-63F	115.0	112.0	104.2	101.0	95.6	91.6	104.2	101.2	22
78.	APPROACH	DC-8-63F	115.0	112.0	106.5	103.1	98.9	95.9	103.8	100.8	22
79.	SIDELINE	DC-9-10	102.0	98.0	102.5	94.6	90.7	85.7			23
80.	TAKEOFF	DC-9-10	90.0	90.0	94.4	89.0	88.5	84.5	77.3	77.3	23
81.	APPROACH	DC-9-10	109.0	109.0	102.5	98.6	94.7	91.7	101.9	101.9	23
82.	SIDELINE	DC-9-15F	102.0	98.0	102.5	94.6	90.7	85.7			24
83.	TAKEOFF	DC-9-15F	90.0	90.0	94.4	89.0	88.5	84.5	77.3	77.3	24
84.	APPROACH	DC-9-15F	109.0	109.0	102.5	98.6	94.7	91.7	101.9	101.9	24
85.	SIDELINE	DC-9-30	103.3	97.3	103.1	95.3	91.3	86.3			25
86.	TAKEOFF	DC-9-30	98.0	91.0	96.5	89.7	90.0	86.0	85.3	78.3	25
87.	APPROACH	DC-9-30	111.0	97.0	103.1	99.1	95.2	92.2	102.9	89.9	25
88.	SIDELINE	DC-9-50	103.5	102.2	103.4	95.7	91.6	86.6			26
89.	TAKEOFF	DC-9-50	98.1	94.7	96.5	89.7	90.0	86.0	85.4	82.0	26
90.	APPROACH	DC-9-50	101.9	101.1	103.4	99.5	95.6	92.6	94.8	94.0	26
91.	SIDELINE	L-1011	95.1	95.1	107.0	100.3	95.4	90.4	83.4	83.2	30
92.	TAKEOFF	L-1011	95.9	95.9	105.6	100.1	96.6	92.6	87.1	85.1	30
93.	APPROACH	L-1011	102.8	102.0	107.0	103.8	99.4	96.4	92.7	90.0	30
94.	SIDELINE	SSC CONCORDE	112.0	112.0	106.8	100.1	95.2	90.2			
95.	TAKEOFF	SSC CONCORDE	119.5	119.5	105.1	101.6	96.2	92.2			
96.	APPROACH	SSC CONCORDE	116.5	116.5	106.8	103.5	99.2	96.2			

APPENDIX E

EXCERPT FROM CTAPORT.DATA

TABLE F

EXCERPT OF AIRCRAFT OPERATIONS DATA FROM CTAPORT.DATA

1200.	79	RC	ORD	DC-9-10	923	408	
1201.	79	RC	ORD	DC-9-30	3216	409	
1202.	79	RC	ORD	DC-9-50	3880	410	
1203.	79	RD	ORD	B-727-100C	49	411	
1204.	79	RD	ORD	DC-8-10	190	412	
1205.	79	RD	ORD	DC-8-50F	181	413	
1206.	79	RD	ORD	DC-8-63F	40	414	
1207.	79	SB	ORD	B-747	120	415	
1208.	79	SB	ORD	B-747F	364	416	
1209.	79	SO	ORD	DC-9-10	902	417	
1210.	79	SO	ORD	DC-9-30	98	418	
1211.	79	TW	ORD	B-707-100B	7881	419	
1212.	79	TW	ORD	B-707-300	184	420	
1213.	79	TW	ORD	B-707-300B	2936	421	
1214.	79	TW	ORD	B-707-300C	267	422	
1215.	79	TW	ORD	B-727-100	5263	423	
1216.	79	TW	ORD	B-727-200	11295	424	
1217.	79	TW	ORD	B-727-100C	1643	425	
1218.	79	TW	ORD	B-747	330	426	
1219.	79	TW	ORD	L-1011	1763	427	
1220.	79	UA	ORD	B-727-100	8552	428	
1221.	79	UA	ORD	B-727-200	22899	429	
1222.	79	UA	ORD	B-737-200	18088	430	
1223.	79	UA	ORD	B-747	2716	431	
1224.	79	UA	ORD	DC-8-50	423	432	
1225.	79	UA	ORD	DC-8-50F	2052	433	
1226.	79	UA	ORD	DC-8-61	3408	434	
1227.	79	UA	ORD	DC-8-62	240	435	
1228.	79	UA	ORD	DC-10-10	10495	436	
1229.	79	AA	MIA	B-707-100B	130	437	
1230.	79	AA	MIA	B-707-300B	263	438	
1231.	79	AA	MIA	B-707-300C	473	439	
1232.	79	AA	MIA	B-727-100	213	440	
1233.	79	AA	MIA	B-727-200	114	441	
1234.	79	AA	MIA	B-747	1	442	
1235.	79	BN	MIA	B-727-100	47	443	
1236.	79	BN	MIA	B-727-200	2497	444	
1237.	79	BN	MIA	B-727-100C	71	445	
1238.	79	BN	MIA	B-747	2	446	
1239.	79	BN	MIA	DC-8-50	1070	447	
1240.	79	BN	MIA	DC-8-62	1677	448	
1241.	79	CO	MIA	B-727-100	933	449	
1242.	79	CO	MIA	B-727-200	1718	450	
1243.	79	CO	MIA	DC-10-10	1	451	
1244.	79	DL	MIA	B-727-200	9027	452	
1245.	79	DL	MIA	DC-8-50	1193	453	
1246.	79	DL	MIA	DC-8-61	1061	454	
1247.	79	DL	MIA	DC-9-30	959	455	
1248.	79	DL	MIA	L-1011	2425	456	
1249.	79	EA	MIA	A-300B	1127	457	
1250.	79	EA	MIA	B-727-100	7919	458	
1251.	79	EA	MIA	B-727-200	8343	459	
1252.	79	EA	MIA	B-727-100C	3006	460	
1253.	79	EA	MIA	DC-9-10	71	461	
1254.	79	EA	MIA	DC-9-30	4213	462	
1255.	79	EA	MIA	DC-9-50	1510	463	
1256.	79	EA	MIA	L-1011	7725	464	
1257.	79	NA	MIA	B-727-100	4128	465	
1258.	79	NA	MIA	B-727-200	6816	466	
1259.	79	NA	MIA	DC-10-10	3209	467	
1260.	79	NA	MIA	DC-10-30	1129	468	

EXCERPT OF AIRCRAFT OPERATIONS DATA FROM CTAPORT.DATA

1261.	79	NC	MIA	DC-9-30	160	469
1262.	79	NC	MIA	DC-9-50	1	470
1263.	79	NS	MIA	B-720B	10	471
1264.	79	NW	MIA	B-727-100	153	472
1265.	79	NW	MIA	B-727-200	1558	473
1266.	79	NW	MIA	B-747	18	474
1267.	79	NW	MIA	DC-10-40	466	475
1268.	79	OZ	MIA	DC-9-10	109	476
1269.	79	OZ	MIA	DC-9-30	787	477
1270.	79	PA	MIA	B-707-300B	2022	478
1271.	79	PA	MIA	B-747	955	479
1272.	79	PA	MIA	B-747C	89	480
1273.	79	PA	MIA	B-747SP	83	481
1274.	79	PI	MIA	B-727-100	7	482
1275.	79	PI	MIA	B-737-200	949	483
1276.	79	QH	MIA	B-737-200	2472	484
1277.	79	QH	MIA	DC-9-10	1480	485
1278.	79	RC	MIA	DC-9-10	1286	486
1279.	79	RC	MIA	DC-9-30	738	487
1280.	79	RC	MIA	DC-9-50	2	488
1281.	79	RD	MIA	B-727-100C	178	489
1282.	79	RD	MIA	DC-8-10	409	490
1283.	79	RD	MIA	DC-8-50F	509	491
1284.	79	RD	MIA	DC-8-63F	275	492
1285.	79	SO	MIA	DC-9-10	1323	493
1286.	79	SO	MIA	DC-9-30	624	494
1287.	79	TW	MIA	B-707-100B	51	495
1288.	79	TW	MIA	B-707-300	2	496
1289.	79	TW	MIA	B-707-300B	47	497
1290.	79	TW	MIA	B-707-300C	8	498
1291.	79	TW	MIA	B-727-100	752	499
1292.	79	TW	MIA	B-727-200	411	500
1293.	79	TW	MIA	B-727-100C	177	501
1294.	79	TW	MIA	L-1011	65	502
1295.	79	UA	MIA	B-727-100	1197	503
1296.	79	UA	MIA	B-727-200	1161	504
1297.	79	UA	MIA	B-737-200	24	505
1298.	79	UA	MIA	DC-8-50	1	506
1299.	79	UA	MIA	DC-8-61	75	507
1300.	79	UA	MIA	DC-8-62	16	508
1301.	79	UA	MIA	DC-10-10	34	509
1302.	79	VA	MIA	B-707-300C	67	510
1303.	79	VA	MIA	B-720B	49	511
1304.	79	VA	MIA	DC-10-10	772	512